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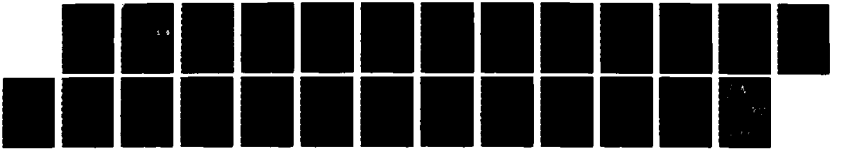

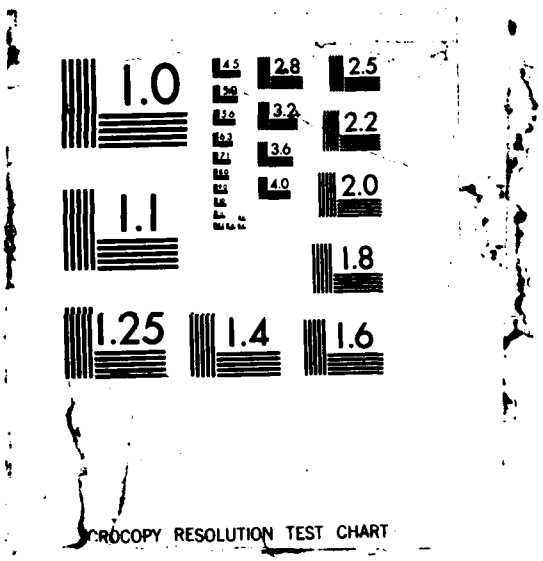
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PREVENTION OF INFLUENZA AND OTHER RESPIRATORY DISEASES - LABORATORY STUDIES

EPIDEMIOLOGICAL SURVEILLANCE OF INFLUENZA AND OTHER RESPIRATORY DISEASES IN MILITARY PERSONNEL

ANNUAL REPORT

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1 FEBRUARY 1986

Supported by

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1. During the winter season of 1983-84, both Influenza A H1N1 and Influenza B were present on the Base. The student population was affected very slightly by either virus. The permanent party had a somewhat higher incidence of Influenza B.

2. Response to vaccination in the fall of 1984: Serum from 120 students vaccinated at the time of induction at Lackland Air Force Base showed excellent response to Influenza A H3N2 and H1N1 and rather poor response to the A/USSR/83 strain of Influenza B. Permanent party failed to show as much response as the students.

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3. The complement fixing antibody response following vaccination was reasonably good for Influenza A in the student body but not in the permanent party. Neither students nor permanent party showed much response to the Influenza B component of the vaccine.

4. Influenza A H3N2 was widespread in the Denver area during December and January. The student population was hardly affected (four cases); 32 cases occurred in the permanent party. Evidence that the virus was widespread was based on the observations that cases occurred not in any single unit but in a number of units on the Base. Complement fixing antibody titers on individuals collected after the epidemic had passed suggested that inapparent infection had been widespread.

5. In the permanent party, cases of Influenza A occurred at the highest rate in individuals in the 33-37 year old age group. Comparison of the three methods used for the diagnosis of influenza indicated that it was important to use all three--virus isolation, H.I. tests, and C.F. tests--in order to detect all cases of Influenza A or B.

6. Attack rates of H3N2 Influenza A were highest in individuals with titers of 8 or less, and were extremely low in people with titers of 32 or more.

7. Only four cases of adenovirus infection were detected throughout the whole season. Streptococcal disease was not a serious problem.

FOREWORD

For the protection of human subjects, the investigator(s) have adhered to policies of applicable Federal Law 45CFR46.

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Summary of Influenza Occurrence during the 1983-84 Season

In contrast with the 1982-83 season when both types of Influenza A and Influenza B occurred, although in small numbers, on the Base, in the 1983-84 season only two viruses were present, namely Influenza B and Influenza A H1N1. The Influenza B appeared immediately after the Christmas break and then followed a peculiar pattern. For 5 weeks only one or two cases appeared, and then after a small spike, early in February a fairly steady increase in the number of cases occurred during the period from February 20 to March 19. There was then a tailoff, with the last case occurring late in April. The diseases affected the permanent party (55 cases) more than the student population (14 cases).

H1N1 Influenza appeared at almost the same time and affected students and young members of the permanent party in roughly equal proportions. The total number of cases in the students was 12 and in the permanent party 20. These observations are illustrated in Figure 1 and Table 1.

Response to Vaccination in Fall 1984

Before his departure from Lackland Air Force Base, Lt. Col. Gremillion arranged for his successor, Major Evans, to collect a paired serum from 120 newly arrived recruits and from 102 permanent party before and 3 weeks after receiving standard military vaccine (whole virus). Major Galbraith also provided 38 pairs of sera from permanent party at Keesler AFB. The vaccine (w.v.) contained 15 mcg each of A/Philippines/82, A/Chile/83 and B/USSR/83. The latter had been substituted for Influenza B strain B/Singapore/79. These sera were collected well before the Christmas break and presumably were drawn at a time when no influenza was occurring. They were run in five tests, each of which included sera from students and permanent party in order to ensure comparability of results between the two groups. Results are shown in Tables 2-5.

Hemagglutination Inhibition Tests

Influenza A H3N2 (Table 1)

Recruits: Sixty percent of the students lacked antibody for A/Philippines/82 prior to vaccination, but following vaccination 84% had titers of 32 or more and 88% had shown a fourfold rise in titer.

Permanent Party: In the permanent party, on the other hand, only 2% were seronegative before immunization, and after immunization 61% had titers of 32 or more. Only 19% had shown a fourfold or greater rise in titer.

Comment: The students, in spite of much lower initial titers, showed a far better response to vaccination and ended up with titers considerably higher than those seen in the permanent party. When one compares the percent of patients with titers of 32 in the permanent party before and after immunization, the difference is relatively small, raising a question of how much benefit was obtained from the re-immunization during the current year.

Influenza A H1N1

Recruits: Thirty-eight percent had titers of less than 8 for A/Chile/82 before vaccination, 81% showed a fourfold rise, and post-vaccination titers of 97% were 32 or higher.

Permanent Party: Only 6% were seronegative before immunization, 19% had a fourfold rise in titer, and 83% had titers of 32 or more after vaccination.

The recruits responded extraordinarily well to the H1N1 antigen. In the permanent party there was less benefit from the annual revaccination.

Influenza B/Singapore/79

Recruits: Forty-two percent had titers of less than 8 in the prevaccination sera, 62% had a rise in titer fourfold or more, and 75% had titers of 32 or more following vaccination.

Permanent Party: Thirteen percent were seronegative before immunization, 14% had a fourfold rise in titer, and 49% had titers of 32 or more after vaccination.

The recruits obviously benefited considerably from the administration of the Influenza B component of the vaccine. Nonetheless, the titer rises were of considerably smaller magnitude than was obtained with either of the Influenza A viruses. This was even more apparent in the permanent party in whom approximately one-half were still below 32 after vaccination tests with this earlier Influenza B strain.

B/USSR/100/83

Recruits: Sixty-two percent were seronegative before vaccination, 50% showed a fourfold rise in titer, and 52% had titers of 32 or more following vaccination.

Permanent Party: Forty-four percent were seronegative before vaccination, only 5% had titer rises of fourfold or more, and only 16% had titers of 32 or more after vaccination.

Comment: Influenza B/USSR/83 is so non-avid that these results are virtually meaningless. We have considered using an ether-treated B/USSR/83 antigen, as is done by the CDC, but are reluctant to do so because, while there is a gain in sensitivity, there is also a loss of specificity. We learned this in 1977 when we first used ether-split antigens to measure antibody against the A/USSR H1N1 viruses. At that time we found in recruits, who could not possibly have been exposed to that virus because they were not alive during its prior prevalence, that some had titers as high as 80 in their prevaccination sera.

One of the advantages of measuring HI antibodies is to obtain an estimate of what level of antibody may be protective against clinical illness. While it is obvious that one must have a titer higher than 32 for protective effect, hard data are lacking on just how high that titer must be. With Influenza B ether-treated antigens, in the past we have seen cases of influenza occurring

in individuals with titers as high as 128, and for this reason we would have preferred a whole virus antigen which has regained avidity, like Influenza A H3N2 strains.

Complement-Fixing Antibody Response

The complement-fixing antibody response following vaccination was determined in 25 recruits and 25 permanent party. The purpose of this was to determine to what extent the CF antibody titer could be used to separate out response to vaccine from that which follows infection. Results are shown in Table 6.

Influenza A

In pre-vaccination sera of the recruits, titers were relatively low for Influenza A, with only 4% having titers of 32% or higher. Fifty-seven percent of the recruits showed a fourfold rise in titer, and following vaccination, titers of 25% were as high as 256 or 512, well in the range of those seen following illness.

Permanent party had somewhat higher titers in their prevaccination sera but showed virtually no change in titer following vaccination. The highest titer seen was 128. This was noted in only 5% of individuals.

Influenza B

Influenza B titers in the recruits were slightly higher than those of Influenza A with 4% having titers of 64. Thirty-eight percent of the recruits had an increase in titer of fourfold or more and a titer of 128 was seen in 4%.

In the permanent party titers were essentially unchanged by vaccination. None of the individuals tested had titers higher than 32, suggesting that anyone found with titers of 64 or more could safely be presumed to have been recently infected by Influenza B. This baseline information is useful in interpreting the results to be presented in subsequent studies of the incidence of inapparent infection in this population.

It should be noted that the individuals received vaccine containing twice as much Influenza A antigen as Influenza B antigen. CF tests with allantoic fluid antigens detect common A antigens and do not discriminate between H1N1 or H3N2 viruses.

Occurrence of Influenza (Figure 2)

Influenza A H3N2 began to be observed in the Denver area during December 1984 and the first cases at Lowry Air Force Base were detected in the week of December 31. The last cases occurred during the week of February 4. While the outbreak in the community was quite sharp and produced a significant increase in the number of hospital admissions for pneumonia and other complications of influenza in civilians, the student population at Lowry was hardly affected. Only four cases were detected during the epidemic period. The permanent party did not fare quite as well with 32 cases, but this still represented an attack rate well under 1%. The overall febrile URI rate during this period in the student population at no time exceeded five per thousand per week, suggesting

a very high level of protection in this totally vaccinated population. One would have predicted this from the data obtained on antibody response to the H3N2 component of the vaccine.

A single case of Influenza B was detected in January and another virus isolate (not shown in Figure 2) was made from the last throat washings collected at the end of May 1985. This illustrates the endemic nature of Influenza B, which probably could be detected somewhere in the country at almost any time of the year.

Table 7 shows the total number of patients reporting with temperatures of 99 degrees or higher with upper respiratory symptoms in students and permanent party from October 30, 1984, to May 20, 1985. Rates expressed as cases per thousand per week are calculated for the students because the population base is known and it is assumed that any student sick enough to miss classes will report to the clinic for treatment. A similar rate is not calculated for the permanent party because (1) it is not known with certainty how many have not been vaccinated during the current year and (2) a number of them might not report to the dispensary with illness since they can be excused for a day or two without recording absence.

Epidemiologic Observations

As in previous years, it was observed that there was no particular concentration of cases in any squadron or unit. Instead, one or two cases occurred in almost every squadron, suggesting that the virus was widespread on the Base. The complement-fixing antibodies of individuals subsequent to the epidemic showed a large number of individuals with high titers, suggesting that inapparent infection had been common.

The distribution of cases by age was of some interest. Through the efforts of Col. Gordon Hutchison, Commander of the Lowry Clinic, a breakdown was obtained by age of current personnel. These data are shown in Table 9. While the number of cases of influenza is small, the rates are sufficiently different to be of interest. Why attack rates should be highest in the age group from 33-37 is not clear. It is possible that this represents the cohort which is most exposed to school children, in whom outbreaks of influenza are notoriously widespread. The very low rates between the ages of 18 and 27 are also worthy of note.

Laboratory Diagnosis of Influenza

Routine virus diagnoses were made using three procedures, namely virus isolation, hemagglutination-inhibition tests, and complement-fixation tests. The reason for continuing to use all three is that no one of them can be counted on to detect all cases of influenza.

Attempts at virus isolation were made with all specimens in rhesus monkey kidney tissue culture and in a few instances in chick embryos. It has become increasingly difficult to get good supplies of eggs with high fertility rates. Tissue culture materials are usually available in sufficient amounts, but occasionally are of inferior quality.

The results obtained in 1984 and 1985 in diagnosing cases of H3N2 influenza are presented in Table 10. H3N2 strains usually grow readily in monkey kidney, and in the past we have had isolation rates of 85-90%. In this year the low figure of 68% was largely due to the fact that during the latter part of the season the tissue culture was of very poor quality and only one-third of the patients had positive throat washings. During the earlier part of the season, the rate had been 89%. HI and CF tests alone picked up between 70% and 75% of the patients. The combination of virus isolation efforts and either serologic test picked up 94% of the total. The main reasons for continuing the HI tests are that CF tests do not distinguish between H1N1 and H3N2 influenza and that CF tests do not provide as good a guide to the protective level of antibody as do HI tests. We have considered using other methods of serodiagnosis, but at the present time see little to be gained and considerably more in the way of cost and effort than we have with these traditional tests.

In reviewing data obtained in earlier years, we have compared the different tests for diagnosis of H1N1 influenza and Influenza B. The results are shown in Table 11. Noteworthy here is the fact that virus isolation rates of H1N1 have been extremely poor, with rates running about 50%. Influenza B isolations have usually been around 80%. The HI tests for both these viruses have been less satisfactory than with H3N2 because of the low avidity of many of the strains used for viral diagnosis. This has been a problem with both viruses and, as noted earlier, has been particularly troublesome with the B/USSR strain currently used in the influenza vaccine.

Relationship between HI Titer and Attack Rate

In the past we have noted repeatedly with H3N2 Influenza A that there is a clear-cut relationship between the HI titer and the probability of clinical illness. A similar relationship has not been clearly demonstrated with either Influenza H1N1 or Influenza B. Tests with these viruses have been complicated by the low avidity of many strains and in the case of Influenza B by the presence of serum inhibitors.

It was therefore of interest to see whether the same relationship would continue to hold with Influenza A of the A/Philippines/82 type. The results shown in Table 12 are comparable to those obtained in earlier years. While the attack rates are uniformly low, they are clearly much higher in individuals with titers of 8 or less than 8, and almost negligible in those with titers of more than 32. Individuals with titers of 16 fall into a swing group in which cases do occur but at a rate considerably lower than those with titers above 32. Individuals with titers of 32 or more have estimated rates of only 0.1%.

Impact of Influenza at Lowry Air Force Base from 1977-1985

Table 13 shows the number of confirmed cases of influenza observed each year in students and permanent party caused by different influenza viruses. The Base has been exposed on 14 occasions during this period through the introduction of one of the types of influenza. Four have been Influenza A H3N2 and five each have been caused by Influenza A H1N1 or Influenza B. The experiences of 1977-78 with the Russian strains of Influenza A H1H1 which appeared in a totally unvaccinated recruit population illustrates what influ-

enza can do in a highly susceptible military population. At no time since that episode has there been a significant amount of disease or disruption of activities during any of the subsequent outbreaks. The recruit population has been particularly well protected against H3N2 Influenza A and against Influenza B. It has not been possible to carry out controlled studies of vaccine effectiveness during this period. However, the repeated epidemics with low attack rates support the usefulness of vaccine in protecting against influenza.

Occurrence of Other Respiratory Diseases

Four cases of adenovirus infections were confirmed with the onset dates of 1/22, 2/26, 3/1 and 3/13/85. Fifty-six patients had throat cultures positive for Group A beta-hemolytic streptococci. Twenty-eight of these were students and twenty-eight were permanent party. No rubella or rubeola were detected.

Current Research Efforts

In addition to maintaining surveillance of activities and evaluating vaccine response, investigations are continuing in the following areas:

1. The rate of fall of antibody during the months after vaccination.

2. The incidence of inapparent infection.

3. The usefulness of complement fixation tests in diagnosis and in evaluation of influenza prevalence.

4. The behavior of Influenza B virus, which is poorly documented and obviously needs further study.

5. Antigenic sin and its effect on vaccine response and susceptibility to clinical illness.

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Richelle Cross in the preparation of this report

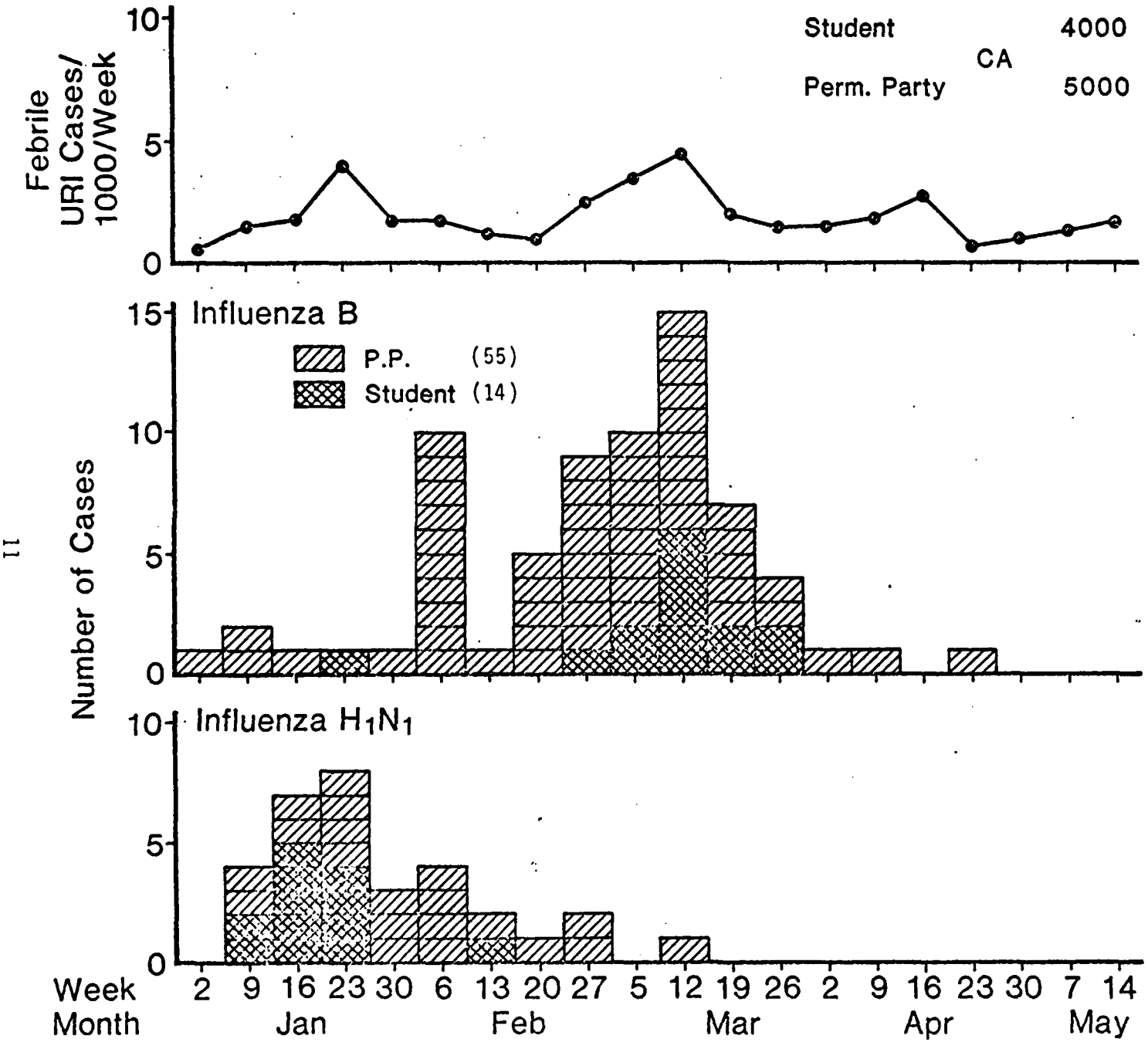

Figure 1. Weekly Febrile URI rates in student population and the number of cases of Influenza H_1N_1 and B in students and permanent party, 1983-84

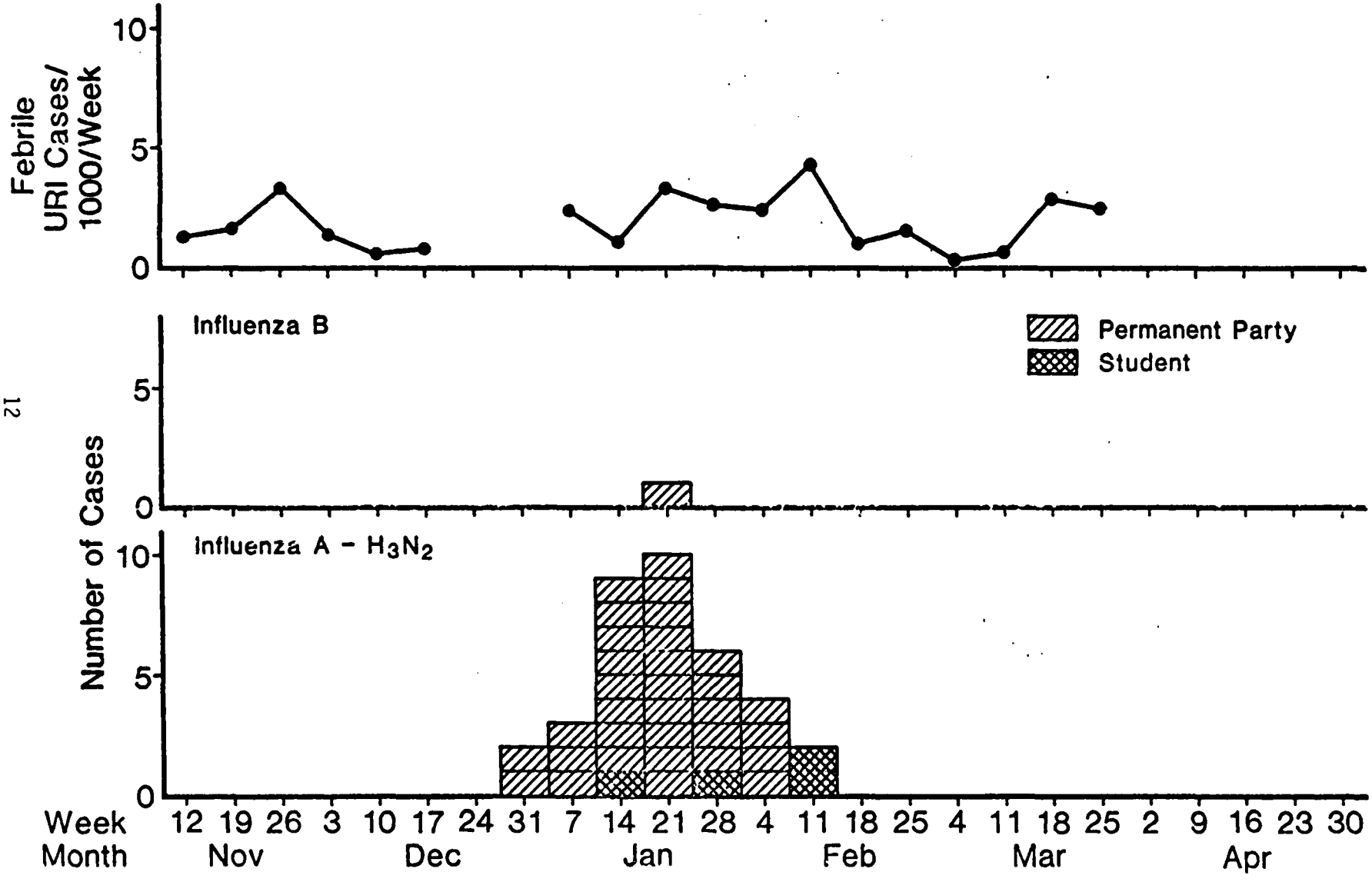

Figure 2. Weekly Febrile URI rates in student population and the number of cases of Influenza H_3N_2 and B in students and permandent party, 1984-85

	Students				Permanent Party		
Week of:	No. of URI	Rate*	No. of Influenza A**	B	No. of URI	No. of Influenza A**	B
Oct 31	0	-	-	-	0		
Nov. 7	1	0.3	-	-	0		
Nov. 14	2	0.5	-	-	2		
Nov. 21	1	0.3	-	-	1		
Nov. 28	2	0.5	-	-	1		
Dec. 5	1	0.3	-	-	4		
Dec. 12	2	0.5	-	-	3		
Dec. 19	-	-	-	-	-		
Dec. 26	-	-	-	-	-		
Jan. 2	2	0.6	-	-	6	-	1
Jan. 9	6	1.7	2	-	18	2	2
Jan. 16	7	2.3	5	1	10	2	1
Jan. 23	16	5.2	4	1	16	4	-
Jan. 31	7	2.3	-	-	14	3	1
Feb. 6	6	1.9	-	-	24	4	10
Feb. 13	5	1.6	1	-	7	1	1
Feb. 20	2	0.6	-	-	8	1	5
Feb. 27	8	2.6	-	1	17	2	8
Mar. 5	12	3.9	-	2	16	-	8
Mar. 12	16	5.2	-	5	19	1	9
Mar. 19	7	2.3	-	2	13	-	5
Mar. 26	4	1.3	-	2	9	-	2
Apr. 2	4	1.4	-	-	9	-	1
Apr. 9	6	2.0	-	-	9	-	1
Apr. 16	4	1.4	-	-	6	-	-
Apr. 23	10	2.5	-	-	2	-	1
Apr. 30	3	0.7	-	-	10	-	-
May 7	5	2.1	-	-	3	-	-
May 14	5	2.1	-	-	10	-	-
May 21	7	2.5	-	-	5	-	-
May 28	3	0.8	-	-	2	-	-

*Cases/1000/week **H1N1

Table 1. Number of cases of febrile URI and of Influenza A and B in students and permanent party in 1983-84.

H3N2

A/Phil/82	Serum	Cumulative percent with H.I. titers >:									Percent with >4X rise
		<8	8	16	32	64	128	256	512	1024	
Recruits	Pre-	60	40	16	13	11	4	2	0	0	
	Post-	1	99	93	84	76	59	46	31	18	88
Permanent Party	Pre-	2	98	69	54	29	10	6	4	2	
	Post-	1	99	78	61	45	22	10	5	3	19

Table 2. H.I. antibody response to A/Philippines/82 of 120 recruits and 102 permanent party who in November 1984 received whole virus vaccine containing 15 ug of hemagglutinin of A/Phil/82, A/Chile/83 and B/USSR/83.

All permanent party had been vaccinated one year before.

H1N1

A/Chile/83 (X-83)	Serum	Cumulative percent with H.I. titers >:									Percent with >4X rise
		<8	8	16	32	64	128	256	512	1024	
Recruits	Pre-	38	62	41	29	14	7	4	1	1	
	Post-	2	98	98	97	90	77	64	51	38	81
Permanent Party	Pre-	6	94	79	63	40	20	10	6	2	
	Post-	1	99	94	83	58	36	15	7	3	19

Table 3. H.I. antibody response to A/Chile/83 of 120 recruits and 102 permanent party who in November 1984 received whole virus vaccine containing 15 ug of hemagglutinin of A/Phil/82, A/Chile/83 and B/USSR/83.

All permanent party had been vaccinated one year before.

B/Singapore/222/79

	Serum	Cumulative percent with H.I. titers >:									Percent with >4X rise
		<8	8	16	32	64	128	256	512	1024	
Recruits	Pre-	42	58	33	19	6	2	1	0	0	
	Post-	3	97	90	75	60	34	18	10	5	62
Permanent Party	Pre-	13	87	56	33	11	4	1	1	1	
	Post-	3	97	77	49	24	9	2	1	1	14

Table 4. H.I. antibody response to B/Singapore/79 of 120 recruits and 102 permanent party who in November 1984 received whole virus vaccine containing 15 ug of hemagglutinin of A/Phil/82, A/Chile/83 and B/USSR/83.

All permanent party had been vaccinated one year before.

B/USSR/100/83

	Serum	Cumulative percent with H.I. titers >:									Percent with >4X rise
		<8	8	16	32	64	128	256	512	1024	
Recruits	Pre-	62	38	17	6	1	0	0	0	0	
	Post-	8	92	74	52	29	16	7	4	3	50
Permanent Party	Pre-	44	56	19	6	2	2	0	0	0	
	Post-	27	73	36	16	4	2	0	0	0	5

Table 5. H.I. antibody response to B/USSR/83 of 120 recruits and 102 permanent party who in November 1984 received whole virus vaccine containing 15 ug of hemagglutinin of A/Phil/82, A/Chile/83 and B/USSR/83.

All permanent party had been vaccinated one year before.

Influenza A

		Cumulative Percent with titer >								% with	% with
		<8	8	16	32	64	128	256	512	2X rise	≥4X rise
Student	Pre:	13	87	21	4	-	-	-	-		
	Post:	0	100	87	63	46	38	21	4	87	56
Permanent Party	Pre:	9	91	69	24	19	5	-	-		
	Post:	5	95	87	28	14	5	-	-	27	0

Influenza B

		Cumulative Percent with titer >									
		<8	8	16	32	64	128	256	512		
Student	Pre:	32	68	12	4	4	-	-	-		
	Post:	4	96	71	38	17	4	-	-	63	38
Permanent Party	Pre:	32	68	38	5	-	-	-	-		
	Post:	27	73	37	5	-	-	-	-	19	5

Table 6. Complement-fixing antibody response of 25 students and 25 permanent party to standard military vaccine

Week of:	Students			Permanent Party		
	# Febrile URI	Number of Cases A**	B	# Febrile URI	Number of Cases A**	B
Oct. 28	0	-	-	0	-	-
Nov. 5	0	-	-	0	-	-
Nov. 12	3	-	-	4	-	-
Nov. 19	4	-	-	7	-	-
Nov. 26	9	-	-	6	-	-
Dec. 3	4	-	-	11	-	-
Dec. 10	7	-	-	6	-	-
Dec. 17	2	-	-	1	-	-
Dec. 24	-	-	-	-	-	-
Dec. 31	0	-	-	5	2	-
Jan. 7	7	-	-	10	3	-
Jan. 14	3	1	-	15	8	-
Jan. 21	10	-	-	13	10	1
Jan. 28	10	1	-	11	5	-
Feb. 4	8	-	-	8	4	-
Feb. 11	12	2	-	8	-	-
Feb. 18	4	-	-	5	-	-
Feb. 25	3	-	-	5	-	-
Mar. 4	2	-	-	8	-	-
Mar. 11	1	-	-	5	-	-
Mar. 18	8	-	-	5	-	-
Mar. 25	6	-	-	6	-	-
Apr. 1	7	-	-	4	-	-
Apr. 8	7	-	-	5	-	-
Apr. 15	4	-	-	7	-	-
Apr. 22	6	-	-	2	-	-
Apr. 29	2	-	-	6	-	-
May 6	4	-	-	5	-	-
May 13	1		-	2	-	-
TOTAL	134	4		170	32	1

Influenza Attack Rate (%) 0.13 **H3N2

Table 7. Results of laboratory tests for influenza in persons with febrile URI, Lowry Air Force Base, 1984-85.

	Number of Cases	Percent <27	Percent >28
Influenza A H1N1	20	100	0
Influenza A H3N2	36	28	82
Influenza B	53	48	53

Table 8. Age distribution of cases of Influenza A H1N1, Influenza A H3N2 and Influenza B

Permanent Party

Age	No. of Persons	No. of Cases	Attack Rate(%)
18-22	2476	2 (1)	0.1
23-27	1896	4 (1)	0.2
28-32	1085	8 (1)	0.7
33-37	734	13 (4)	1.8
38-42	515	4 (1)	0.8
43-47	155	1 (1)	0.7
48-52	47	-	-
>53	30	-	-
TOTAL	6936	32 (9)	0.5
Students			
18-22	3221	4	0.1

( ) indicates unvaccinated persons

Table 9. Influenza A attack rates by age in permanent party and students, January-February 1985

Test(s)	No. Positive/No. Tested	% Positive
Virus Isolation	21/31*	68
H.I. (A/Phil/83)	22/31	71
C.F. (A/Bangkok/79)	23/31	74
Virus Isolation + H.I.	29/31	94
Virus Isolation + C.F.	29/31	94
H.I. + C.F.	29/31	94
Virus Isolation + H.I. + C.F.	31/31	100

*Before Jan. 25 with good RMKTC. 17/19 positive = 89%

After Jan. 26 with poor RMKTC. 4/12 positive = 33%

Table 10. Comparison of sensitivity of three procedures for diagnosis of Influenza A (H3N2) - 1985

Test	Influenza A (H1N1)		Influenza B	
	No. +/No. Tested	% Positive	No. +/No. Tested	% Positive
Virus Isolation	16/33	48	52/67	78
H.I.	23/29	79	47/60	78
C.F.	27/29	93	58/60	97

Table 11. Comparison of tests to confirm the diagnosis of influenza

Titer	No. of Cases	Estimated No. of Persons	Estimated Attack Rate (%)
<8-8	22	1122	2.0
16	4	867	0.5
≥32	3	3111	0.1

Table 12. Estimated attack rates of Influenza A (H3N2) in permanent party with different H.I. antibody titers for A/Phil/82.

Virus	Year	Number of Cases	
		Students	Permanent Party
A-H3N2	1977-8	4 (0)	22 (7)
	1980-1	1 (0)	13 (9)
	1982-3	1 (0)	8 (0)
	1984-5	4 (0)	32 (0)
		10 (0)	75 (25)
A-H1N1	1977-8	1500 (*)	
	1978-9	31 (3)	59 (12)
	1980-1	67 (1)	45 (15)
	1981-2	16 (0)	27 (10)
	1982-3	14 (0)	6 (0)
	1983-4	12 (0)	20 (6)
		140 (4)	157 (43)
B	1979-80	5 (1)	23 (4)
	1981-2	5 (0)	35 (6)
	1982-3	0 (0)	11 (2)
	1983-4	14 (0)	56 (13)
	1984-5	0 (0)	2 (0)
		24 (1)	127 (25)

*Estimated. No vaccine available when "Russian Flu" appeared.

( ) indicates cases in unvaccinated persons.

Table 13. Comparison of number of confirmed cases of influenza in students and permanent party. Average student population approximately 3,200; permanent party approximately 6,900. Almost all students had received trivalent vaccine; up to 15% of permanent party may have failed to receive vaccine in year of outbreak.

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